PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

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PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing *(day/month/year)*	07.09.2004
Applicant's or agent's file reference DPW/Y1501	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB 03/03383	04.08.2003	10.08.2002 +30m = 10/12/2002

Applicant
LUCITE INTERNATIONAL UK LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Roche, S Tel. +49 89 2399-8031

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference DPW/Y1501	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB 03/03383	International filing date *(day/month/year)* 04.08.2003	Priority date *(day/month/year)* 10.08.2002
International Patent Classification (IPC) or both national classification and IPC C07C51/14		
Applicant LUCITE INTERNATIONAL UK LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 1 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
16.02.2004	07.09.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Jardon Alvarez, J Telephone No. +49 89 2399-8325

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB 03/03383

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-40	as originally filed

Claims, Numbers

1 (part), 2-31	as originally filed
1 (part)	received on 23.07.2004 with letter of 16.07.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

see separate sheet

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos. 29,31

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

☒ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. 29,31 are so unclear that no meaningful opinion could be formed *(specify)*:

see separate sheet

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos.

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the Standard.

☐ the computer readable form has not been furnished or does not comply with the Standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-28
	No:	Claims	30
Inventive step (IS)	Yes:	Claims	1-28
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-28
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item I
Basis of the report

1. Claim 1 has been amended by the Applicant and is now directed to the carbonylation of C_3-C_{20} ethylenically unsaturated compounds. It is however noted that dependent claim 28 still embraces the use of ethene as starting material. For the establishment of the present report it is assumed that claim 28 will be adapted to claim 1 and that ethene is deleted from claim 28.

Re Item III
Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. Claims 29 and 31 contain references to the description and/or examples. According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here. These claims are therefore not examined.

Re Item V
Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

(D1) WO - A - 96/19434
(D2) WO - A - 01/68583
(D3) WO - A - 01/72697

1. Claim 30.

   Claim 30 is drafted along the lines of "product by process". Such a claim is considered as a claim to the compound per se. It can only be considered allowable if the product is new and it cannot be defined in any other way.

   As acid and esters according to claim 30 such as, for instance, methyl butyrate, are manifestly already known the subject-matter of claim 30 is not novel (Article 33(2) PCT).

2. Claims 1 to 28.

2.1. None of the documents cited in the Search Report discloses the carbonylation of C_3-C_{20} ethylenically unsaturated compounds by reaction with carbon monoxide in the presence of a catalyst containing a group VIII metal and a bidentate phosphine at a **temperature between -30 °C and 49 °C** and under a CO partial pressure of less than 30×10^5 N m^{-2}.

Documents D2 and D3 disclose the same carbonylation reaction but at a temperature between 50 and 250 °C (cf. D2, claim 1 and page 9, lines 10 - 11 and D3, claim 1 and page 12, lines 26 - 27). Document D1 discloses the carbonylation of ethylene (see claim 1).

The subject-matter of claims 1 to 28 is then novel (Article 33(2) PCT).

2.2. The subject-matter of claims 1 to 28 also involves an inventive step (Article 33(3) PCT).

Document D2 can be considered as the closest prior art. It discloses the same carbonylation reaction using bidentate phosphine catalysts but using temperatures over 50 °C.

The problem to be solved by the present application can then be seen as to provide an carbonylation process wherein the final product is obtained **with improved selectivity and improved linearity**.

This problem is solved by the process of claim 1 under conditions of lower temperature and lower carbon monoxide pressure than used in the prior art. The examples and comparative examples in the present description (see Tables 1 and 2) show that improved selectivity and linear:branched ratio are achieved when the carbonylation reaction is carried out under reaction conditions falling within the scope of claim 1 when compared with the reaction conditions of the processes as disclosed on D2 and D3.

None of the cited documents recognizes the beneficial effect of the use of moderate reaction conditions to improve the selectivity of the carbonylation process and therefore they cannot give a hint to the now claimed process. Additionally it is noted that the Applicant has submitted to the International Preliminary Examining Authority experimental evidence showing that the process also works for the carbonylation of propene (compare with D1, page 5, lines 18 -

21).

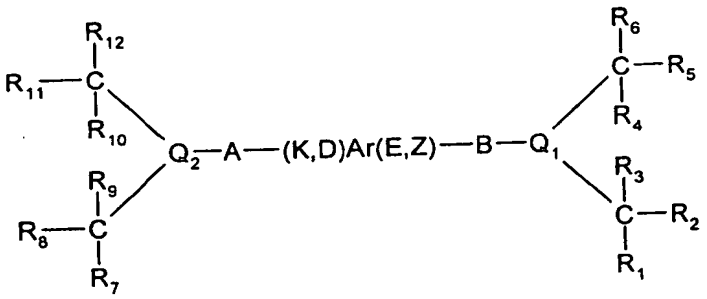
For these reasons, the subject-matter of claims 1 to 28 involves an inventive step (Article 33(3) PCT).

CLAIMS

1. A process for the carbonylation of C_3-C_{20} ethylenically unsaturated compounds which process comprises reacting said C_3-C_{20} ethylenically unsaturated compound with carbon monoxide in the presence of a source of hydroxyl groups and of a catalyst system, the catalyst system obtainable by combining:

(c) a metal of Group VIII or a compound thereof: and

(d) a bidentate phosphine of general formula (I)



wherein:

Ar is a bridging group comprising an optionally substituted aryl moiety to which the phosphorus atoms are linked on available adjacent carbon atoms;

A and B each independently represent lower alkylene;

K, D, E and Z are substituents of the aryl moiety (Ar) and each independently represent hydrogen, lower alkyl, aryl, Het, halo, cyano, nitro, OR^{19}, $OC(O)R^{20}$, $C(O)R^{21}$, $C(O)OR^{22}$, $NR^{23}R^{24}$, $C(O)NR^{25}R^{26}$, $C(S)R^{25}R^{26}$, SR^{27}, $C(O)SR^{27}$, or $-J-Q^3(CR^{13}(R^{14})(R^{15}))CR^{16}(R^{17})(R^{18})$ where J represents lower alkylene; or two adjacent groups selected from K, Z, D and E together with the carbon atoms of the aryl ring to which they are attached form a further phenyl ring, which is